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By-Rahmlow, Harold F.; And Others

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This programed mathematics textbook is for student use in vocational education courses. It was developed as part of a programed series covering 21 mathematical competencies which were identified by university researchers through task analysis of several occupational clusters. The development of a sequential content structure was also based on these mathematics competencies. After completion of this program the student should be able to count decimal places, multiply any two decimal fractions, and round off a product to a given number of decimal places. The material is to be used by individual students under teacher supervision. Twenty-six other programed texts and an introductory volume are available as VT 006 882-VT 006 909, and VT 006 975. (EM)

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FINAL REPORT
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# Occupational Mathematics

# MULTIPLICATION OF DECIMALS

June 1968

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Occupational Mathematics

# MULTIPLICATION OF DECIMALS

Project No. OE7-0031
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Report No. 16-K

by
Harold F. Rahmlow
Karl Ostheller
Clarence Potratz
Leonard T. Winchell
Arthur Snoey

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Washington State University, Department of Education, Pullman, Washington
State Coordinating Council for Occupational Education, Olympia, Washington

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# OBJECTIVES

1. The student should know how to count decimal places.

2. The student should be able to multiply any two decimals.

3. The student should be able to round off a product to a given number of decimal places.

Greetings! You are about to begin improving your knowledge of basic mathematics. There are many important uses for the mathematics you are learning.

This booklet is not like your ordinary books. It is designed to help you learn as an individual. On the following pages you will find some information about mathematics. After the information is presented, you will be asked a question. Your answers to these questions will determine how you proceed through this booklet. When you have selected your answer to the question, turn to the page you are told to.

Do not write in this booklet. You may wish to have a pencil and some paper handy so you can write when you want to.

Remember this is not an ordinary book.

1. Study the material on the page.
2. Read the question on the page (you may want to restudy the material on the page).
3. Select the answer you believe is correct.
4. Turn to the page indicated by your answer.

Are you ready to begin?

(a) Yes — Turn to page 1

(b) No — Turn to page C

(c) HELP — Go see your teacher

Your answer was (b) No.

Well, this booklet is a little different.

Go back and read page B again. After you have read it, you will probably be ready to begin.

In this Unit you will learn how to multiply numbers containing decimals.

Let's get started.

How many decimal places are in the number .27 ?

(a) I'm not sure what a decimal place is
Turn to page 2

(b) 2 Turn to page 13

(c) 0 Turn to page 4

The idea of a decimal place is one you must understand.

Go to Unit 8 (Concepts of Decimals and Fractions) and review the ideas presented there. Then, return to page 1 of this Unit.

No! You were wrong.

Notice that in .0095 each zero takes up one place just like each positive number. So, .0095 really has 4 decimal places. ZEROES ARE ALWAYS PLACE HOLDERS.

How many decimal places in .03009 ?

(a) 2 Turn to page 15

(b) 4 Turn to page 16

(c) 5 Turn to page 17

Wrong!

Finding the number of decimal places is really easy. You simply find the decimal point and count the number of digits to the RIGHT of the decimal point. You should remember that digits are the counting numbers 0 through 9.

Let's try again.

How many decimal places are there in .812 ?

(a) 0 Turn to page 6

(b) 2 Turn to page 5

(c) 3 Turn to page 9

Come on now! I know you can count.

Go back to page 4 and try again.

No! That's not it.

Let's do one. For example, in the number .726 there are 3 decimal places because there are 3 digits to the right of the decimal point.

How many decimal places are there in .72658 ?

(a) 1 Turn to page 7

(b) 3 Turn to page 8

(c) 5 Turn to page 9

Sorry! I can't think of any other way to help you.

Go to your teacher for an explanation.

Then go to page 1 of this Unit.

Sorry! I can't think of any other way to help you.

Go to your teacher for an explanation.

Then, go to page 1 of this Unit.

Correct!

Remember, simply count the digits to the RIGHT OF THE DECIMAL POINT to find the number of decimal places.

How many decimal places are in the number .1384 ?

(a) 1 Turn to page 11

(b) 3 Turn to page 10

(c) 4 Turn to page 13

Are you sure you counted correctly?

Better go back to page 9 and try again.

Incorrect!

You said one decimal place was in the number .1384. Come on now. For each of the digits 1, 3, 8 and 4 you count <u>one</u> decimal place. Therefore, there are 4 decimal places in .1384.

I'll give you another chance.

How many decimal places in .201 ?

(a) 1 Turn to page 6

(b) 2 Turn to page 12

(c) 3 Turn to page 9

Don't be fooled by the zero. It takes up a place too.

Go back to page 11 and try again.

Very good!

Here's a similar one.

How many decimal places in .0095 ?

(a) 2 Turn to page 3

(b) 4 Turn to page 20

(c) 6 Turn to page 14

Very good!

Here's a similar one.

How many decimal places in .0095 ?

(a) 2 Turn to page 3

(b) 4 Turn to page 20

(c) 6 Turn to page 14

2 ??  How did you get 2?

I think you'd better go back to page 3 and be a little more careful when you work the problem this time.

Sorry! That's not quite it.

It's really very easy. How many digits do you see in the following number? (Remember, zero is a digit.) The number is .00705. There are 5 digits. Right? Then this number has 5 decimal places -- one for each digit on the right of the decimal point. Come on now. Concentrate!

How many decimal places are there in .006 ?

(a) 1 Turn to page 6

(b) 2 Turn to page 6

(c) 3 Turn to page 18

Very good! I think you have it.

Here's one more just to be sure.

How many decimal places are in .4005 ?

(a) 4 Turn to page 20

(b) 3 Turn to page 18

(c) 2 Turn to page 16

No! The correct answer was 4. Did you count wrong? Don't be careless.

How many decimal places are in .706 ?

(a) 2 Turn to page 16

(b) 3 Turn to page 17

(c) 4 Turn to page 19

Sorry! That's not quite it.

It's really very easy. How many digits do you see in the following number? (Remember, zero is a digit.) The number is .00705. There are 5 digits. Right? Then, this number has 5 decimal places -- one for each digit on the right of the decimal point. Come on now. Concentrate!

How many decimal places are there in .006 ?

(a) 1 Turn to page 6

(b) 2 Turn to page 6

(c) 3 Turn to page 18

Excellent!

Let's continue.

How many decimal places are there in 7.38 ?

(a) 1 Turn to page 23

(b) 2 Turn to page 26

(c) 3 Turn to page 29

Right! You weren't fooled by the number in front of the decimal point.

Here's another one.

How many decimal places are in 11.259 ?

(a) 2 Turn to page 25

(b) 3 Turn to page 26

(c) 5 Turn to page 32

How did you get 6? That is incorrect.

Simply count every digit (including zeroes) to the RIGHT OF THE DECIMAL POINT. Numbers to the left of the decimal point do not matter when counting decimal places.

How many decimal places are in 10.04 ?

(a) 2 Turn to page 34

(b) 3 Turn to page 35

(c) 4 Turn to page 37

No! Not quite. This one was a little tougher.

In counting decimal places, DO NOT COUNT ANYTHING TO THE LEFT OF THE DECIMAL POINT!

Now let's try another one.

How many decimal places are in 738.6 ?

(a) 1 Turn to page 21

(b) 3 Turn to page 24

(c) 4 Turn to page 27

Incorrect!

Count only the digits to the right of the decimal point.

How many decimal places are there in 237.65 ?

(a) 5 Turn to page 30

(b) 3 Turn to page 31

(c) 2 Turn to page 21

Incorrect!

It doesn't matter what is on the left-hand side of the decimal point when counting decimal places.

WE COUNT ONLY THE DIGITS TO THE RIGHT OF THE DECIMAL!

How many decimal places are in 3.724 ?

(a) 1 Turn to page 24

(b) 3 Turn to page 21

(c) 4 Turn to page 33

Very good! You were correct.

How many decimal places in 7003.20176 ?

(a) 9 Turn to page 28

(b) 6 Turn to page 22

(c) 5 Turn to page 40

Incorrect.

Count only the digits to the right of the decimal point.

How many decimal places are there in 237.65?

(a) 5 Turn to page 30

(b) 3 Turn to page 31

(c) 2 Turn to page 21

No!

Granted, there were 9 digits. However, every digit does not add to the number of decimal places. Only digits to the right of the decimal point do.

How many decimal places are in 10.04 ?

(a) 2 Turn to page 34

(b) 3 Turn to page 36

(c) 4 Turn to page 37

No! Not quite. This one was a little tougher.

In counting decimal places, DO NOT COUNT ANYTHING TO THE LEFT OF THE DECIMAL POINT.

Now, let's try another one.

How many decimal places are in 738.6 ?

(a) 1 Turn to page 21

(b) 3 Turn to page 24

(c) 4 Turn to page 27

No! The number 237.65 has 2 decimal places.

Ask your teacher for additional help in this area.

Then return to page 20.

No! The number 237.65 has 2 decimal places.

Ask you teacher for additional help in this area.

Then return to page 20.

Whoops! Careful now.

Remember, only places on the right of the decimal count.

Go back to page 21 and try again.

Are you sure you counted correctly? A careless mistake, maybe?

Turn to page 24 and continue from there.

Quite correct!  You are progressing well.

Here's another one.

How many decimal places are in 306.2 ?

(a) 1  Turn to page 40

(b) 3  Turn to page 37

(c) 4  Turn to page 38

Your answer was 3. You were a little careless in your work.

Better go back to page 22 and try again.

Your answer was 3. You must have been a little careless.

Better go back to page 28 and try again.

Come on now! You're not trying hard enough.

In a number like 106.3049 there are 4 decimal places. The 3, 0, 4, and 9 each take one place.

How many decimal places are in 170.03 ?

(a) 5 Turn to page 30

(b) 3 Turn to page 31

(c) 2 Turn to page 34

I know you can do better than that.

How can there be 4 decimal places in 306.2? Are there 4 digits to the right of the decimal point? No! There is only one. So, the number has <u>one</u> decimal place.

How many decimal places are in 10.706 ?

(a) 2 Turn to page 37

(b) 3 Turn to page 34

(c) 5 Turn to page 39

Come on now. You're not trying hard enough.

In a number like 106.3049 there are 4 decimal places. The 3, 0, 4, and 9 each take one decimal place.

How many places are in 170.03?

(a) 5 Turn to page 30

(b) 3 Turn to page 31

(c) 2 Turn to page 34

Very good!

So far we have been counting decimal places. The reason for this is that it is very important in multiplication. Let's do an example and see why.

Multiply: 3.2 x 1.6

$$\begin{array}{r} 3.2 \\ \times 1.6 \\ \hline 192 \\ 32 \\ \hline 5.12 \end{array}$$

Notice that there are 2 decimal places in the result. How can you know? Simple.

> The number of decimal places in the product is equal to the sum of the number of decimal places in the two numbers being multiplied.

(Continue on next page)

Remember this rule. Learn it well.

Let's see if you understand it.

How many decimal places would be in the product of

17.2 and 5.9 ?

(a) I don't know what the word "Product" means
Turn to page 41

(b) 3 Turn to page 42

(c) 2 Turn to page 50

A Product is the answer you get in a multiplication problem.

For example, the product of 5 and 4 is 20. Whenever you are asked to find a product, it means you should multiply.

Go back to page 40 now and do the problem.

No! Let's see how it should be done.

The numbers were 17.2 and 5.9. Each number has one decimal place. Right? O.K. Then the product would have 2 decimal places -- the sum of 1 and 1.

How many decimal places would be in the product of 3.19 and 5.8 ?

(a) 2 Turn to page 44

(b) 3 Turn to page 45

(c) 5 Turn to page 43

Come on now. Let's think a little.

The problem didn't ask you to count all the digits.

Go back to page 42 and try again.

No! That's incorrect. I'll try to explain it one more time.

To determine the number of decimal places in the product of two numbers you should:

1. Count the number of decimal places in the first number.
2. Count the number of decimal places in the second number.
3. Add these results together.
4. The sum is the number of decimal places that should appear in the product.

The product of 1.1 and 3.2 would have _____ decimal places.

(a) 1 Turn to page 46

(b) 2 Turn to page 45

(c) 3 Turn to page 48

Very good!

Here's another.

How many decimal places would be in the product of 14.786 and 2231.9 ?

(a) 4 Turn to page 50

(b) 6 Turn to page 49

(c) 10 Turn to page 47

I don't think you're trying very hard.

All you have to do is count decimal places like you did before. Only now you must add the number of places in two numbers. That isn't too tough, is it?

Go to page 40 and try a little harder this time.

10 ?? You know better than that!

You counted all the digits. Now, try a little harder on this one.

How many decimal places would be in the product of 4.71 and 9.622?

(a) 2 Turn to page 44

(b) 4 Turn to page 51

(c) 5 Turn to page 45

I don't think you're trying very hard.

All you have to do is count decimal places like you did before. Only now you must add the number of places in two numbers. That isn't too tough, is it?

Go to page 40 and try a little harder this time.

You were careless! Did you count the digits on the left side of the decimal? Which ones should you have counted?

Go back to page 45 and try again.

Correct!

How about trying another one?

How many decimal places would be in the product of 90.002 and 3.06 ?

(a) 3 Turn to page 52

(b) 5 Turn to page 56

(c) 8 Turn to page 53

No! That's incorrect. I'll try to explain it one more time.

To determine the number of decimal places in the product of two numbers you should:

1. Count the number of decimal places in the first number.
2. Count the number of decimal places in the second number.
3. Add these results together.
4. The sum is the number of decimal places that should appear in the product.

The product of 1.1 and 3.2 would have _____ decimal places.

(a) 1 Turn to page 46

(b) 2 Turn to page 45

(c) 3 Turn to page 48

Sorry, wrong answer. Did the zeroes confuse you?

Remember, in counting decimal places <u>TREAT A ZERO THE SAME AS ANY OTHER DIGIT</u>.

Work this one.

There should be _____ decimal places in the product of 1.07 and 90.32.

(a) 4 Turn to page 54

(b) 3 Turn to page 46

(c) 2 Turn to page 48

Sorry, wrong answer. Did the zeroes confuse you?

Remember, in counting decimal places TREAT A ZERO THE SAME AS ANY OTHER DIGIT.

Work this one.

There should be _____ decimal places in the product of 1.07 and 90.32.

(a) 4 Turn to page 54

(b) 3 Turn to page 46

(c) 2 Turn to page 48

Right! Keep up the good work.

How many decimal places in the product of 30.3 and 9.001 ?

(a) 3 Turn to page 44

(b) 4 Turn to page 56

(c) 7 Turn to page 55

No! That's incorrect. I'll try to explain it one more time.

To determine the number of decimal places in the product of two numbers you should:

1. Count the number of decimal places in the first number.
2. Count the number of decimal places in the second number.
3. Add these results together.
4. The sum is the number of decimal places that should appear in the product.

The product of 1.1 and 3.2 would have _____ decimal places.

(a) 1 Turn to page 46

(b) 2 Turn to page 45

(c) 3 Turn to page 48

Correct! Now you should be ready to work some problems completely.

There are two things to remember:

1. Multiply the numbers as if no decimals are there.
2. Then, locate the decimal in the product.

What is the product of 3.2 and 4.1 ?

(a) 1.312 Turn to page 57

(b) 131.2 Turn to page 59

(c) 13.12 Turn to page 65

Oops! What did you do? You should have chosen 13.12, since it has two decimal places.

Here's another chance.

7.9 x 8.5 = ?

(a) 6.715 Turn to page 61

(b) 65.25 Turn to page 58

(c) 67.15 Turn to page 60

What ??  I think you slipped up on your multiplication.

Go back to page 57 and work it again.

Oops! What did you do? You should have chosen 13.12, since it has two decimal places.

Here's another chance.

7.9 x 8.5 = ?

(a) 6.715 Turn to page 61

(b) 65.25 Turn to page 58

(c) 67.15 Turn to page 60

Very good!

Can you do another one?

What is the product of 4.7 and 6.2 ?

(a) 2.834 Turn to page 63

(b) 29.14 Turn to page 65

(c) 28.34 Turn to page 66

You are having trouble, aren't you? Let's work an example together.

What is 3.7 x 2.9 = ?

```
  3.7   --- one decimal place
x2.9    --- one decimal place
 333
  74
10.73   --- two decimal places
```

Notice in the example that the answer has two decimal places -- the sum of one decimal place from each of the numbers: 3.7 and 2.9.

It is really very easy. Study this example until you are sure you understand it.

O.K. Now try this one.

Multiply: 6.4 by 8.6.

(a) 55.04 Turn to page 60

(b) 5.504 Turn to page 62

(c) 550.4 Turn to page 64

No! You still are having trouble counting decimal places. That's really all we are doing here.

Go back to page 40 and start from there.

Sorry, wrong again. You really missed that one.

You multiplied wrong, and your decimal was off too.

Better concentrate a little harder on this one.

What is 4.7 x 1.5 ?

(a) 70.5 Turn to page 61

(b) .705 Turn to page 67

(c) 7.05 Turn to page 60

No! You still are having trouble counting decimal places. That's really all we are doing here.

Go back to page 40 and start from there.

Right! You're doing fine.

The product of 12.71 and 3.6 is _____.

(a) 45.756 Turn to page 74

(b) 36.636 Turn to page 68

(c) 4.5756 Turn to page 69

Oops! You didn't multiply correctly.

Better go back to page 60 and try again.

You are having trouble, aren't you? Let's work an example together.

What is 3.7 x 2.9 = ?

```
  3.7 ---one decimal place
x2.9 ---one decimal place
 333
  74
10.73 --- two decimal places
```

Notice in the example that the answer has two decimal places -- the sum of one decimal place from each of the numbers: 3.7 and 2.9.

It is really very easy. Study this example until you are sure you understand it.

O.K. Now try this one.

Multiply: 6.4 by 8.6.

(a) 55.04 Turn to page 60

(b) 5.504 Turn to page 62

(c) 550.4 Turn to page 64

No! You didn't get it. Let's try to work it together.

```
 12.71   --- two decimal places
  3.6    --- one decimal place
 7626
3813
45.756   --- three decimal places
```

Notice that the <u>total number</u> of decimal places in the problem add up to the number of decimal places that appear in the product. <u>THIS MUST ALWAYS BE TRUE</u>.

Now you work this one.

32.46 x 19.7 = <u>?</u>

(a) 6394.62 Turn to page 72

(b) 639.462 Turn to page 70

(c) 63.9462 Turn to page 71

No! You didn't get it. Let's try to work it together.

```
 12.71   --- two decimal places
  3.6    --- one decimal place
 7626
3813
45.756   --- three decimal places
```

Notice that the <u>total number</u> of decimal places in the problem add up to the number of decimal places that appear in the product. <u>THIS MUST ALWAYS BE TRUE</u>.

Now you work this one.

32.46 x 19.7 = ___?___

(a) 6394.62 Turn to page 72

(b) 639.462 Turn to page 70

(b) 63.9462 Turn to page 71

Correct!

See if you can do another.

Multiply: 12.19 and 2.8

(a) 32.832 Turn to page 73

(b) 3.413 Turn to page 71

(c) Not given Turn to page 74

Incorrect! Your problem si locating the correct decimal position in the product.

The procedure is simple. First, multiply the numbers as if no decimal were there. Then, count how many <u>total decimal places</u> were in the numbers being multiplied. This total is the number of decimal places that should be in your answer.

Let's try again.

4.17 x 2.3 = ?

(a) 8.011 Turn to page 67

(b) 9.591 Turn to page 70

(c) 10.431 Turn to page 61

Incorrect! Your problem is locating the correct decimal position in the product.

The procedure is simple. First, multiply the numbers as if no decimal were there. Then, count how many <u>total decimal places</u> were in the numbers being multiplied. This total is the number of decimal places that should be in your answer.

Let's try again.

4.17 x 2.3 = ?

(a) 8.011 Turn to page 67

(b) 9.591 Turn to page 70

(c) 10.431 Turn to page 61

Come on now. Take a little more time.

You multiplied the numbers incorrectly.

Go back and try the problem on page 70 again.

Fine! Keep up the good work.

Try this problem.

The product of 22.70 and 10.10 is _____.

(a) 229.27 Turn to page 76

(b) 229.2700 Turn to page 75

(c) 22.9270 Turn to page 77

Yes! Your answer was correct.

But do you remember the rule about zeroes on the end of a decimal? They really aren't needed, are they? For example, you know that 15.78 = 15.7800 or that 125.362 = 125.362000. In the last problem you were asked to multiply 22.70 and 10.10. Wouldn't it be easier to simply make it 22.7 x 10.1? Sure it would.

Keeping these things in mind, go back to page 74 and work the problem again.

Good! You correctly dropped the zeroes off the end of the decimal.

Try this one.

Multiply: 14.2 by 7.5.

(a) 106.5 Turn to page 83

(b) 110.5 Turn to page 81

(c) Not given Turn to page 79

Incorrect!

How can you multiply a number larger than 22 by a number larger than 10 and arrive at a number under 23? Before you choose an answer be sure it is logical.

O.K. Let's try again.

What is 3.60 x 9.10 ?

(a) 32.76 Turn to page 76

(b) 32.46 Turn to page 78

(c) 32.7600 Turn to page 80

Careful now! I think you get the idea, but don't be careless when multiplying the numbers.

Go back to page 77 and rework the problem.

Wrong! The correct answer was given.

Remember what we have said about zeroes on the end of a decimal? They can be left off.

Keep this in mind and go back to page 76 and try the problem again.

Yes! Your answer was correct. But do you remember the rule about zeroes on the end of a decimal? They really aren't needed, are they?

For example, you know that 23.71 = 23.7100 or that 956.398 = 956.3980000. In the last problem you were asked to multiply 3.60 by 9.10. Wouldn't it be easier to simply make it 3.6 x 9.1? Sure it would!

Keeping these things in mind, go back to page 77 and work the problem again.

No! You need to be more careful when you multiply.

You multiplied that one incorrectly.

Try this one.

12.36 x 7.5 = ?

(a) 9.27 Turn to page 71

(b) 927 Turn to page 72

(c) 92.7 Turn to page 65

What ??  How did you get that?

I think you were a little careless.

Go back to page 83 and work the problem again.

Very good!

Try this one.

81.7 x 4 = ?

(a) 325.8 Turn to page 82

(b) 326.8 Turn to page 87

(c) 32.58 Turn to page 85

Watch it! Don't be careless when you multiply.

Go back to page 85 and be more careful this time.

Wrong answer! Let's take a look at one like it.

This type of problem is easier than most. When you multiply a decimal by an integer, the number of decimal places in the answer is always the same as the number of decimal places in the number being multiplied.

For example: 3.7 x 4 = 14.8

14.96 x 8 = 119.68

21.09 x 6 = 126.54

Just remember than an integer has no decimal places. So, when you are counting decimal places in an answer, an integer will not add any places. The rule you know about counting decimal places still works.

(Continue on next page)

Now you try another one.

Find the product of 21.6 and 4.

(a) 84.4 Turn to page 84

(b) 8.64 Turn to page 86

(c) 86.4 Turn to page 87

No! You are still having difficulty with locating the decimal correctly.

You need to go over some of the ideas again.

Turn to page 56.

Right!

Let's see if you can do another one.

Multiply: 3.1 by 17.0

(a) 527.0 Turn to page 88

(b) 52.7 Turn to page 92

(c) 53.77 Turn to page 90

Watch it! You should be able to work this problem correctly.

3.1 x 17.0 really means 3.1 x 17. You should remember that 17 = 17.0 = 17.0000----- and so on. Then, 3.1 x 17 = 52.7. There is one decimal place in the product because the number 3.1 has one decimal place.

Now, what is 14.06 x 12.0 ?

(a) 168.072 Turn to page 89

(b) 168.72 Turn to page 92

(c) 168.720 Turn to page 91

Incorrect! Somehow you put in a zero that didn't belong there. Let's work it together.

14.06 x 12.0 is really just 14.06 x 12.

$$\begin{array}{r} 14.06 \\ \times \quad 12 \\ \hline 2812 \\ 1406 \\ \hline 168.72 \end{array}$$

Notice that the product has two decimal places -- the same as 14.06. This will always happen when you multiply by an integer.

Here's one more.

Find 17.00 x 3.9.

(a) 66.3 Turn to page 83

(b) 6.630 Turn to page 71

(c) 663.0 Turn to page 72

Watch it! You should be able to work this problem correctly.

3.1 x 17.0 really means 3.1 x 17. You should remember that 17 = 17.0 = 17.000--- and so on. Then, 3.1 x 17 = 52.7. There is one decimal place in the product because the number 3.1 has one decimal place.

Now, what is 14.06 x 12.0 ?

(a) 168.072 Turn to page 89

(b) 168.72 Turn to page 92

(c) 168.720 Turn to page 91

Do you remember that zeroes are not needed on the end of a decimal?

Go back to page 88 and see if there is a better answer.

Excellent!

Try this one.

12.3 x 21.114 = ?

(a) 25.97 Turn to page 97

(b) 2597.02 Turn to page 94

(c) 259.7022 Turn to page 100

Oops! Better watch your multiplication.

Go back to page 94 and try again.

No! You misplaced the decimal point. Also, do not round your answers in this unit unless instructed to do so.

Multiply: 321.1 x 28.6

(a) 8873.46 Turn to page 93

(b) 9183.46 Turn to page 96

(c) 918.346 Turn to page 98

Incorrect! Your problem is locating the correct decimal position in the product.

The procedure is simple. First, multiply the numbers as if no decimal were there. Then, count how many <u>total decimal places</u> were in the numbers being multiplied. This total is the number of decimal places that should be in your answer.

Let's try again.

4.17 x 2.3 = ?

(a) 8.011 Turn to page 67

(b) 9.591 Turn to page 70

(c) 10.431 Turn to page 61

Your answer was correct. You are progressing well.

Here's another one.

What is 2.32 x 10.3 = ?

(a) 238.96 Turn to page 101

(b) 23.896 Turn to page 100

(c) 2.3896 Turn to page 98

No! You misplaced the decimal point. Also, do not round your answers in this Unit unless instructed to do so.

Multiply: 321.1 x 28.6.

(a) 8873.46 Turn to page 93

(b) 9183.46 Turn to page 96

(c) 918.346 Turn to page 98

No! Wrong answer.

Do you remember what we have been doing this entire Unit? We have been practicing the correct location of the decimal point. Let's review the rule once more. To find the number of decimal places in the product of two numbers, simply add up the number of decimal places in the two numbers being multiplied. This sum will be the number of decimal places that you should put in the product. Come on now. See if you can do better.

Try this one.

What is 32.2 x 8.71 ?

(a) 280.462 Turn to page 96

(b) 28.0462 Turn to page 95

(c) 2804.62 Turn to page 99

Incorrect! Your problem is locating the correct decimal position in the product.

The procedure is simple. First, multiply the numbers as if no decimal were there. Then, count how many <u>total decimal places</u> were in the numbers being multiplied. This total is the number of decimal places that should be in your answer.

Let's try again.

4.17 x 2.3 = ?

(a) 8.011 Turn to page 67

(b) 9.591 Turn to page 70

(c) 10.431 Turn to page 61

Very good! You are doing well.

What is the product of 17.82 and 12.41 ?

(a) 221.1462 Turn to page 104

(b) 2211.462 Turn to page 103

(c) 22114.62 Turn to page 102

No! Wrong answer. Do you remember what we have been doing this entire Unit? We have been practicing the correct location of the decimal point. Let's review the rule once more. To find the number of decimal places in the product of two numbers, simply add up the number of decimal places in the two numbers being multiplied. This sum will be the number of decimal places that you should put in the product. Come on now. See if you can do better.

Try this one.

What is 32.2 x 8.71 = ?

(a) 280.462 Turn to page 96

(b) 28.0462 Turn to page 95

(c) 2804.62 Turn to page 99

Oops! You mislocated your decimal in the answer.

See if you can do better on this one.

14.32 x 37.14 = ?

(a) 53.18448 Turn to page 98

(b) 5318.448 Turn to page 101

(c) 531.8448 Turn to page 104

Oops! You mislocated your decimal in the answer.

See if you can do better on this one.

14.32 x 37.14 = ?

(a) 53.18448 Turn to page 98

(b) 5318.448 Turn to page 101

(c) 531.8448 Turn to page 104

Excellent! You have demonstrated your ability to multiply decimals. There is one other area we need to discuss. That is the process of rounding off.

Sometimes you may have a number with four decimal places, and perhaps you only want one decimal place. In order to do this, you approximate by the process known as rounding off.

For example, 8.32 rounded to the nearest integer becomes 8.

12.489 rounded to one decimal place becomes 12.5.

732.675 rounded to two decimal places becomes 732.68.

Here is the general rule to follow:

To round off to a required number of decimal places, look at the number one place to the right of the required decimal place. If this number on the right is 5 or more, raise the number on the left one higher.

(Continue on next page)

If the number on the right is less than 5, make no change. In either case, omit all numbers to the right of the required number of decimal places.

Here's one for you to work.

Round 78.9135 to two decimal places.

(a) 78.9 Turn to page 106

(b) 78.91 Turn to page 110

(c) 78.92 Turn to page 107

No! You didn't quite catch it. Let's look at some more examples.

EXAMPLE 1

Rounding 3.638 to 2 decimal places gives us 3.64.
to 1 decimal place gives us 3.6.
to the nearest integer gives us 4.

EXAMPLE 2

Rounding 93.4812 to 2 decimal places gives us 93.48.
to 1 decimal place gives us 93.5
to the nearest integer gives us 93.

(On this last part, note that we do not round the 93.5, but the original number 93.4812.)

Study these examples. Make sure you understand how to do each one. If you need to review the rule, go back to page 104 and study it. Make certain you see how the rule applies to each example.

Now, turn to page 107 for your next problem.

No! You didn't quite catch it. Let's look at some more examples.

EXAMPLE 1

Rounding 3.638 to 2 decimal places gives us 3.64

to 1 decimal place gives us 3.6

to the nearest integer gives us 4

EXAMPLE 2

Rounding 93.4812 to 2 decimal places gives us 93.48

to 1 decimal place gives us 93.5

to the nearest integer gives us 93

(On this last part, note that we do not round the 93.5, but the original number 93.4812.)

Study these examples. Make sure you understand how to do each one. If you need to review the rule, go back to page 104 and study it. Make certain you see how the rule applies to each example.

Now, turn to page 107 for your next problem.

Here is your problem.

What is 14.06 rounded to one decimal place?

(a) 14 Turn to page 109

(b) 14.07 Turn to page 111

(c) 14.1 Turn to page 108

Your answer is correct.

See if you can do another one.

Round of 128.7588 to three decimal places.

(a) 128.76 Turn to page 112

(b) 128.758 Turn to page 115

(c) 128.759 Turn to page 110

Incorrect.

You said 14.06 rounded to one decimal place is 14. No! 14 would be correct rounded to the nearest integer, but you were asked to leave <u>one</u> decimal place.

Go back to page 107 and re-do the problem.

Excellent! You are doing very well.

What is .12345 rounded to four places?

(a) .1234 Turn to page 119

(b) .1235 Turn to page 122

(c) .12355 Turn to page 116

No! Let's look at what you did.

You tried to round 14.06 into 14.07. But this isn't even rounding off, is it? When you round off, you always end up with fewer decimal places than you had to start with. What you did here was to add .01, which is incorrect.

Here's another one to work.

Round 5.788 to one decimal place.

(a) 5.6 Turn to page 113

(b) 5.7 Turn to page 114

(c) 5.8 Turn to page 108

What? Since when does 128.76 have three decimal places?

Better go back to page 108 and take another look at the problem.

No! You didn't get the point.

Go back to page 104 and start from there. Study carefully before working the problems.

No! You didn't get the point.

Go back to page 104 and start from there. Study carefully before working the problems.

No! You forgot the rule.

You must look at the decimal position to the right of the number of places you want. If this number is 5 or more, you should raise the number on the left by one. In our problem it was above 5, so you should have increased it by one.

Do this problem.

Round 148.314 to two decimal places?

(a) 148.3 Turn to page 113

(b) 148.31 Turn to page 108

(c) 148.32 Turn to page 114

No! You forgot to drop the last digit after you rounded.

Go back to page 110 and see if you can make a better selection.

Correct! Keep up the good work.

Round 59.3333 to two decimal places.

(a) 60.00 Turn to page 120

(b) 59.34 Turn to page 121

(c) 59.33 Turn to page 122

Watch it!

You rounded correctly to two decimal places. But the problem asked for one place. Be sure to read what the problem wants you to do.

Go back to page 119 and try again.

Oops:

Notice that in the number .12345, the fifth decimal position is a 5. Then, in rounding to four places, we should increase by one the number to the left of the 5. The correct answer to four places is .1235.

Round 10.639 to one decimal place.

(a) 10.6 Turn to page 117

(b) 10.7 Turn to page 114

(c) 10.64 Turn to page 118

No! Your answer was incorrect.

The number was 59.3333. To round this to <u>two</u> places, look at the third decimal place in 59.3333. This is less than 5. Right? So you simply write it as 59.33.

Now, round 93.28 to one decimal place.

(a) 93 Turn to page 115

(b) 93.3 Turn to page 117

(c) 93.2 Turn to page 115

No! Your answer was incorrect.

The number was 59.3333. To round this to <u>two</u> places, look at the third decimal place in 59.3333. This is less than 5. Right? So you simply write it as 59.33.

Now, round 93.28 to one decimal place.

(a) 93 Turn to page 115

(b) 93.3 Turn to page 117

(c) 93.2 Turn to page 115

Very good!

In the last few problems you have been practicing "rounding off." This process is often used after performing multiplication, division, or possibly some other operation. Let's see if you can combine what you know about multiplication and rounding off.

What is 10.3 x 17.4 rounded to one decimal place?

(a) 180.3 Turn to page 123

(b) 179.2 Turn to page 125

(c) 180.2 Turn to page 127

No! You should have gotten 180.2262 when you multiplied. Then, after rounding off to one decimal place you would get 180.2, the correct answer.

Try not to make any careless mistakes.

What is 38.4 x 17 rounded to the nearest integer?

(a) 652.8 Turn to page 124

(b) 652 Turn to page 128

(c) 653 Turn to page 126

What?? The question asked you to round to the nearest integer. Is 652.8 an integer? Of course not!

Go back to page 123 and try again.

No! When you work a problem like this, you should multiply the given numbers before you round off. Never round off the numbers in the problem.

ROUND ONLY YOUR ANSWER!

See if you can do the problem on page 122 now.

Your answer was correct. Very good!

What is .387 x 11 rounded to one decimal place?

(a) 4.3 Turn to page 127

(b) 4.26 Turn to page 131

(c) 4.2 Turn to page 130

Excellent! You multiplied correctly and rounded off the product to obtain the right answer.

Multiply 25.5 by 1.23 and round off the product to two decimal places.

(a) 31.37 Turn to page 132

(b) 31.4 Turn to page 133

(c) 31.36 Turn to page 134

No! You rounded off incorrectly.

Find the product of 9.2 and 8.3 correct to one decimal place.

(a) 76.5 Turn to page 129

(b) 76.4 Turn to page 126

(c) 76.6 Turn to page 115

No! You forgot the rule.

You must look at the decimal position to the right of the number of places you want. If this number is 5 or more, you should raise the number on the left by one. In our problem it was above 5, so you should have increased it by one.

Do this problem.

Round 148.314 to two decimal places.

(a) 148.3 Turn to page 113

(b) 148.31 Turn to page 108

(c) 148.32 Turn to page 114

No! You're off the path.

All you need to do is multiply the numbers as they are. Then, when you get the product, round it off to the number of decimal places desired. O.K., see if you can do better now.

What is 12.1 x 3.2 rounded to one decimal place?

(a) 38.7 Turn to page 126

(b) 38.8 Turn to page 128

(c) 38.9 Turn to page 140

Try again! 4.26 does <u>not</u> have one decimal place.

You're just not concentrating!

Go back to page 126 and work the problem over.

Good job! You have made it through this Unit successfully. Let's review what you have learned.

1. You should be able to count decimal places.
2. You should be able to multiply two decimals and correctly locate the decimal point in the product.
3. You should be able to round off a decimal to a given number of decimal places.
4. You should be able to multiply two decimals and round off your answer.

Now, go see your teacher for a test over this Unit.

31.4 would be correct to one decimal place. But you weren't asked for one decimal place.

Go back to page 127 and reread the problem!

Oops! Did you forget the rule?

In this problem you multiplied 25.5 by 1.23 and should have gotten 31.365. Now, to round to <u>two places</u>, you look at the digit in the third place. If it is five or over, you drop it and add one to the digit on its left. So, to two decimal places 31.365 becomes 31.37.

Now, what is 1.7 x 3.4 to the nearest integer?

(a) 4 Turn to page 137

(b) 5.9 Turn to page 141

(c) 6 Turn to page 136

What? The problem asked for <u>one</u> decimal place.

Turn to page 139 and try again.

Fine! Your answer was correct.

Now, what is the product of 25.5 and 13.21 to one decimal place?

(a) 336.9 Turn to page 132

(b) 33.7 Turn to page 138

(c) 337 Turn to page 137

You still seem to be having difficulty with decimal places.

Remember, each digit to the right of the decimal point is one decimal place.

What is 3.6 x 2.1 to one decimal place?

(a) 76 Turn to page 140

(b) 7.6 Turn to page 136

(c) 7.5 Turn to page 128

No! You multiplied correctly, but you mislocated the decimal point.

You should have noticed the 25 x 13 even without any decimals would be larger than 33.69. Sometimes a little common sense can be very helpful.

What is 7.3 x 1.61 rounded to two decimal places?

(a) 1.175 Turn to page 137

(b) 13.46 Turn to page 139

(c) 11.75 Turn to page 136

Oops! You weren't very careful with your multiplication.

What is 17.4 x 1.2 correct to one decimal place?

(a) 20.9 Turn to page 136

(b) 20.88 Turn to page 135

(c) 21.0 Turn to page 137

No! You rounded off incorrectly.

Find the product of 9.2 and 8.3 correct to one decimal place.

(a) 76.5 Turn to page 129

(b) 76.4 Turn to page 126

(c) 76.6 Turn to page 115

What? The problem asked you to round off your answer to the nearest integer.

Turn to page 134 and try again.

NORTHWEST REGIONAL EDUCATIONAL LABORATORY
400 Lindsay Building 710 S. W. Second Avenue
Portland, Oregon 97204

CAI MATHEMATICS

TEST QUESTIONS

UNIT 10 - MULTIPLICATION OF DECIMALS

Directions: The correct answers will always be expressed in lowest terms.

1. How many decimal places are there in .203?

   a) 1

   b) 2

   c) 3

2. What is (2.3) (3.6)

   a) 8.28

   b) 828

   c) .828

3. Multiply 17.3 and 4.6 and round off to one-decimal place.

   a) 79.58

   b) 79.6

   c) 79.5

4. There are _____ decimal places in 17.06

   a) 0

   b) 2

   c) 4

5. What is 3.7 x 9.31

   a) 34.447

   b) 35

   c) 3.45

Unit 10 (continued)

6. Multiply .312 by .24 and round off to three places.

   a) .0749

   b) .075

   c) .749

7. Write 12345 with three decimal places

   a) 12.345

   b) .12345

   c) 123.45

8. Multiply the numbers 17.42 and 3.9

   a) 679.4

   b) 67.838

   c) 67.938

9. How many decimal places should be in the product of 1.73 and 12.611?

   a) 4

   b) 5

   c) 6

10. How many decimal places are in .1256?

   a) 1

   b) 3

   c) 4

11. What is 14.06 x 12.0

   a) 168.72

   b) 168.072

   c) 168.1

12. Round off 23.14 x 7.93 to one decimal place

   a) 183.5002

   b) 161.2

   c) 183.5

13. How many decimal places in 10.07513

    a) 7

    b) 5

    c) 2

14. Multiply 50 by .003

    a) .15

    b) .015

    c) .0015

15. How many decimal places should be in the product of 23.96 and 15.3233?

    a) 4

    b) 5

    c) 6

16. In .3712, the second decimal place is the

    a) 3

    b) 7

    c) 1

17. Multiply .08 by .0071

    a) .000568

    b) .0568

    c) .568

18. Multiply 14.1 by 3.16 and round to one place

    a) 44.5

    b) 42.56

    c) 44.6

19. How many decimal places in 3758.5?

    a) 1

    b) 4

    c) 5

Unit 10 (continued)

20. What is .33 x .33?

a) 1.089

b) .1079

c) .1089

21. Round off 132.315498 to three decimal places

a) 132.3

b) 132.315

c) 132.316

22. Count the decimal places in 3.1416

a) 4

b) 5

c) 3

23. Multiply 129.3 and .004

a) .5172

b) 5.172

c) 51.72

24. Round off .0003 to two decimal places

a) .01

b) 1.0

c) .00

25. Which of the following has 2 decimal places?

a) 2.025

b) 20.25

c) 202.5

ANSWER SHEET

UNIT 10 - MULTIPLICATION OF DECIMALS

1. c
2. a
3. b
4. b
5. a
6. b
7. a
8. c
9. b
10. c
11. a
12. c
13. b
14. a
15. c
16. b
17. a
18. c
19. a
20. c
21. b
22. a
23. a
24. c
25. b

To the instructor: The above problems are related to the objectives as follows:

OBJECTIVE 1 : Questions 1.4,7,10,13,16,19.22,25

OBJECTIVE 2 : Questions 2.5,8.11,14,17,20,23

OBJECTIVE 3 : Questions 3,6,9,12.15,18,21,24